**Osmosis in Purple Onion**

**Problem:** How do solutions of various salt concentrations influence osmosis in relation to an onion cell?

**Background:** A substance that dissolves in another substance is called a **solute**, and the substance that does the dissolving is called the **solvent**. In living things, water is the solvent. The mixture of solute and solvent is called a **solution**. Solute and solvent tend to diffuse from areas of high concentration to areas of low concentration. When water moves from higher concentration of water to lower concentration of water through a cell membrane, it is called **osmosis**.

**Materials/Equipment:**

10% salt solution Microscope slide

Distilled water Coverslip

Piece of red onion Paper towels

Pipette or medicine dropper Microscope

**Procedure:**

**Read the following procedure and make 2 hypotheses:** 1) What do you think you will see when you add the salt solution to the slide? 2) What do you think you will see when you add the water to the slide?

1. Make a wet mount of the red onion epidermis.

2. Examine under low power. When you have a clear view of several cells, switch to medium power. Make a labeled drawing, properly labeled in your data. This will give you a record of the original appearance of the onion cells.

3. Take a dropper and add several drops of salt solution to one side of your cover slip while placing a small piece of paper towel along the opposite edge of the cover slip. The paper should draw out the water and draw in the salt solution.

4. Observe the effects of the saline (salt) solution on the onion cells. Make a properly labeled, careful drawing of the cells appearance in a second properly labeled carefully constructed drawing in your data.

5. Replace the sodium chloride solution with distilled water in the same way that the salt solution was added.

6. Observe the effects of the water solution on the onion cells. Make a properly labeled drawing of the cells appearance in your data.

7. Clean and dry the slide and coverslip.

8. Answer the questions which follow your data.

**ONION OSMOSIS LAB REPORT**

**Problem:** How do solutions of various salt concentrations influence osmosis in relation to an onion cell?

**Hypothesis 1:** What do you think you will see when you add the salt solution to the slide? (1 T/I)

**Hypothesis 2:** 2) What do you think you will see when you add the water to the slide? (1 T/I)

**Data Collection:** (10 marks C)

Drawing # 1: Onion Cell under medium power (2 C)

Drawing # 2: Onion Cell under medium power with salt solution (4 C)

OBSERVATIONS: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Drawing # 3: Onion Cell under medium power with water (4 C)

OBSERVATIONS: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Discussion Questions:**

1. What direction did water move when you placed the onion piece in the salt solution? (1K/U)

2. What direction did water move when you added the distilled water? (1K/U)

3. Fill in the chart below using either the words “hypertonic” or “hypotonic.” (2T/I)

|  |  |  |  |
| --- | --- | --- | --- |
| **Conditions** | **Environment**  **solution is** | **Cell**  **solution is** | **Water** |
| If a solute concentration in the environment is lower than in the cell |  |  | will move into the cell. |
| If a solute concentration in the environment is higher than in the cell |  |  | will move out of the cell. |

4. Why do plants wilt? (3 A)

5. Red blood cells placed in a distilled water solution usually swell up and burst. What prevented the red onion cells from swelling up and bursting when they were placed in the distilled water? (1T/I, 1 A)

6. Why do grocery store owners spray fresh fruits and vegetables with water? (3 A)

**Osmosis in Purple Onion**

(Teacher Notes)

**Lab Time:** 30 minutes

**Pre-Activity:**

Prepare a 10% salt solution. Review with students the definition of solution, solute, and solvent. Discuss and define osmosis. The movement of the water through the membrane is illustrated in the activity. The process of movement from an area of greater water concentration to an area of lesser water concentration will be observed.

**Activity:**

Circulate the room throughout the lab. Help students with microscope work as needed. Students should see the cells shrink as the salt water surrounds them. The cell membrane will pull away from the cell wall, and the cytoplasm will round out. As the distilled water is introduced, cells will take on water again and will fill back out to the cell wall.

**Student Questions and Answers:**

1. What did you observe when you placed the onion piece in the salt solution*? The onion cells in the salt solution shrink; their cytoplasm pulls away from the cell wall.*

2. What did you observe when you added the distilled water*? Water will diffuse into the cells and the cytoplasm expands.*

3. What can you infer about the movement of water between cells and their external environment? *Students may infer that water diffuses either way across the membrane; cells respond to their environment.*

4. Why do plants wilt*? When plants do not get enough water, the cells shrink and plants lose their rigidity.*

Weigh **10g** of sodium chloride. Pour it into a graduated cylinder or volumetric flask containing about **80ml** of water. Once the sodium chloride has dissolved completely (swirl the flask gently if necessary), add water to bring the volume up to the final 100 ml. Caution: Do not simply measure **100ml** of water and add 10g of sodium chloride. This will introduce error because adding the solid will change the final volume of the solution and throw off the final percentage.

***Wicking Technique***

a. Place a few drops of new solution along one side of the cover glass.

b. Use small piece of paper towel getting saturated as it draws the old solution out from under the cover glass.

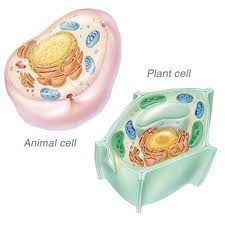
c. It is possible to see the paper towel getting saturated as it draws the old solution out from under the cover glass.

d. The paper towel should be replaced once it is completely wet.

e. Two or more applications of new solution may have to be used to completely replace the old solution from under the cover glass.

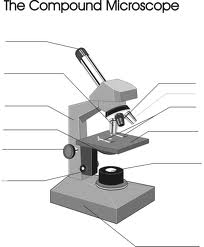
**ONION OSMOSIS PRE-LAB**

1. Define the following terms:
2. Solute
3. Solvent
4. Osmosis
5. What does a plant cell have surrounding the cell membrane that an animal cell does not have? (see diagram below)

[](http://www.google.ca/imgres?q=plant+cell+and+animal+cell&hl=en&biw=1280&bih=633&gbv=2&tbm=isch&tbnid=mNsZZ2NJAuLhFM:&imgrefurl=http://www.mybigcampus.com/groups/mbc-trainers/group_pages/plant-cell-vs-animal-cell-activity-grades-7-10--2&docid=Lbr5hJhAYJkt5M&imgurl=http://www.mybigcampus.com/gridfs/mongo_document/file/2011-7-20-4e272cc59317c924ff000001/large_Plant_20_26_20Animal_20Cells.jpg&w=450&h=450&ei=T9tHT6WlIMreggfe2djpDQ&zoom=1)

1. Review the following diagram of the microscope. Using your textbook to help you, label the following parts on the microscope (Hint: all labels on the diagram will not be filled in)

* Arm, ocular lens, coarse-adjustment knob (big), stage, fine adjustment knob (small), base objective lens, revolving nosepiece, stage clips, light source

[](http://www.google.ca/imgres?q=microscope+diagram&hl=en&biw=1280&bih=633&gbv=2&tbm=isch&tbnid=W7BcGwlWaK5nUM:&imgrefurl=http://phsgirard.org/AcademicBiology.html&docid=uCXAQ8X0j2kz-M&imgurl=http://phsgirard.org/Biology/Cells/CellOrganelles/Microscopes/microscope.jpg&w=1108&h=1339&ei=k4VLT5uUGMP9ggeM3biEDg&zoom=1)

1. Place the following steps in the correct order for viewing a slide through a compound light microscope.
2. Rotate the nose-piece to the medium power objective lens
3. Use the fine adjustment knob to bring the image into focus
4. Place the slide on the stage and hold it in place with the stage clips
5. Use the coarse adjustment knob to bring the low power objective lens close to the slide
6. Make sure the low power objective lens is in place